International Research Journal of Engineering, IT & Scientific Research
Available online at https://sloap.org/journals/index.php/irjeis/
Vol. 6 No. 6, November 2020, pages: 21-30
ISSN: 2454-2261
https://doi.org/10.21744/irjeis.v6n6.1024

Application of Discovery Learning Learning Model to Improve Mathematics Knowledge Competence

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Article history:

Submitted: 09 August 2020
Revised: 18 September 2020
Accepted: 27 October 2020

Keywords:

competence;
discovery learning;
knowledge competency;
learning model;
remedial;

Abstract

This study aims to improve the competence of mathematics content knowledge of grade II A students of SD No. 5 Dalung for the 2020/2021 school year by applying the Discovery Learning learning model. The subjects of this study were students of grade V SD No. 5 Dalung, totaling 26 students. This research was conducted in two learning cycles, with the stages in each cycle being planning, executing an action, observing and evaluating, and reflecting. The results of knowledge competencies were analyzed descriptively by determining the class average value and learning completeness. The results of the analysis showed that there was an increase in the average score of competence in the knowledge of Mathematics content, namely 57.69 cycles I and cycle II to 80.96 with 58% completeness in cycle I and cycle II to 100%. In general, this PTK can answer questions that have been formulated and can achieve the expected goals. This can be seen from the fulfillment of the specified criteria, namely the competence of students' knowledge at the end of the second cycle has met the KKM.

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1 Introduction

With the development of science and technology, education plays an important role in preparing quality human resources who can compete. Education should be implemented properly to get maximum results. This can be achieved by implementing timely and appropriate education to achieve learning objectives. Timely education, which is education given from an early age, begins by providing education in kindergartens, elementary schools, while appropriate education is education that can be used as an effort to achieve the expected goals, namely improving the quality of human resources.

So far, education is still dominated by the view that knowledge is a set of facts that must be memorized. Classes still focus on the teacher as the main source of knowledge, then lectures are the main choice of learning strategies. Therefore, we need a learning strategy that does not require students to memorize facts, but a strategy that encourages students to construct knowledge in their minds (Elliot, 1982; Hopkins, 2008).

There is a tendency today to return to the idea that children will learn better if the learning environment is created naturally. Learning will be more meaningful if children experience what they learn, not know it. Target-oriented learning of mastery of the material has proven successful in short-term competencies but fails to equip children to solve problems in the long term. Based on the observation result, it is known that the competence of students' learning knowledge is still low (Ghasemaghaei, 2019; Becerra-Fernandez, 2000). This is evidenced by the data from the midterm exam results showing that out of 26 students only 11 students have completed while 15 students have not completed, with an average score of 52.46 and KKM 65. Some deficiencies in the learning process can be seen in the activities that take place inside. The class has not yet been referred to as active, effective, and meaningful learning (Kemmis & McTaggart, 1988; Mubarak, 2011). Based on the explanation above, it can be seen that the knowledge competence of students of class II A in the Thematic lesson of Mathematics content in SD No. 5 Dalung through the Discovery Learning learning model. The learning process takes place naturally in the form of activities students work and experience, not the transfer of knowledge from teachers to students. A learning strategy is far more important than a result.

In addition to the above problems that cause the low competence of students' knowledge, among others: a) lack of interest in class II A students SD No. 5 Dalung towards Thematic learning in Mathematics content, b) the learning model used is less varied, c) Discovery Learning learning model is rarely used in Thematic learning Mathematics content class II A SD No. 5 Dalung. This problem shows the need to make improvements and improve the quality of learning (Notoatmodjo, 2010; Sunartana, 1992). Improvement of learning from boring to fun can be done by using models, approaches, or learning models that allow students to be more active. Several models can be used in Thematic learning, one of which is Discovery Learning.

2 Materials and Methods

This classroom action research will be conducted at SD No. 5 Dalung which is located on Jl. Padang Luwih No. 135, Br. Celuk, North Kuta District, Badung Regency. This classroom action research selects research subjects in the class that it supports, namely in Class II A SD No. 5 Dalung, totaling 26 people. The object of the research was the improvement of the knowledge competence of Class II-A students of SD No. 5 Dalung Academic Year 2020/2021 after the Discovery Learning model was applied to the learning process of Mathematics content (MacWhinney & Leinbach, 1991; Metcalfe & Kornell, 2005).

This research uses Classroom Action Research (CAR) which is focused on classroom situations. Class action research is research conducted by teachers in their class through self-reflection to improve their performance as teachers so that students' competency in knowledge increases (Aqib, 2006; Shadiq, 2014; Syah, 2004). Four stages are passed, namely, planning, implementing, observing, and reflecting, as follows: (1) Planning is planning a program of action (2) Acting is learning conducted by researchers to improve student learning outcomes in learning. (3) Observation (observing) is the observation of students during learning. (4) Reflection is an activity to review and consider the results obtained from observations so that revisions can be made to the next learning process. The four stages are carried out repeatedly in the form of cycles, which are carried out in this study 2 cycles.

Cycle I

The planning stage

a) Determine the learning material being taught, namely Mathematical Contents.
b) The researcher and the teacher discuss to agree about learning activities using the discovery learning model.
c) Making a Syllabus and Learning Improvement Plan (RPP)
d) Prepare learning media that will be used during the learning process in class.
e) Making student worksheets (LKPD) in the form of test questions to obtain student knowledge competency data.

Implementation Stage

In cycle 1, it begins with activities to manage the Mathematics content learning process. The implementation of the action refers to the RPP made. In the implementation of learning using the discovery learning model (Rieber et al., 2004; Kuensting et al., 2013; Hanafi & Soepriyanti, 2018), there are several stages, namely:

a) Stimulation (Stimulation / Giving Stimulation)
b) Problem Statement (Statement / Problem Identity)
c) Data Collection (Data Collection)
d) Data Processing (Data Processing)
e) Verification (Proof)
f) Generalization (Draw Conclusions Generalization)

Observation Stage

At this stage, observations are carried out during the learning process from the beginning to the end, the researcher observes the competence of students' knowledge during the learning process using the observation sheet that has been made. The researcher conducts discussions with the teacher to discuss what weaknesses or deficiencies are in the learning process.

Reflection Stage

The results achieved in the observation stage are collected and analyzed in this stage. Reflection is carried out by looking at the observational data whether the applied learning process can improve students' knowledge competencies. The results of the data analysis carried out in this stage are used as a reference for planning the next cycle

Cycle II

If the research has not shown success, it is necessary to continue in cycle II. At the end of the cycle I, researchers have reflected on the learning process carried out by the teacher as a reference.

Planning Stage

a) Record the constraints faced in the learning process that has been carried out in cycle I.
b) Designing improvements for the learning process in cycle II based on reflection and cycle I.
c) Determine the learning material to be taught, namely Mathematical Contents.
d) The researcher and the teacher discuss to agree about learning activities using the Discovery Learning model that is following the teaching material and learning objectives.
e) Creating a mapping, syllabus, and improvement plan (RPP).
f) Prepare learning media that will be used during the learning process in class.
g) Develop learning evaluation tools.

Action Stage

a) Stimulation (Stimulation / Giving Stimulation)
b) Problem Statements (Statement / Problem Identity)
c) Data Collection (Data Collection)
d) Data Processing (Data Processing)
e) Verification (Proof)
f) A generalization (Draw Conclusions Generalization)

Observation Stage
Like the previous cycle, at this stage, an observation was carried out on the implementation of the action using the observation sheet that had been made. Then hold discussions with the collaboration teacher to discuss what weaknesses or deficiencies are in the learning process.
Reflection Stage
The results achieved in the observation stage are collected and analyzed in this stage. Reflection is carried out by looking at the observational data whether the applied learning process can improve students' knowledge competencies. The data on the results of the implementation of cycles I and II were then collected for use in preparing reports on the results of classroom action research. From the activity stage in cycles I and II the expected results are:

a) The teacher can optimally utilize the Discovery Learning model so that it can stimulate, guide, and direct students into a more active learning process.
b) There was an increase in knowledge competence in class II A SD No. 5 Dalung.

Data Collection Methods
The data collected in this study are knowledge competency data collected through knowledge competency tests. The knowledge competency test used in this study is a multiple-choice question to show student understanding, and a knowledge competency test will be given at the end of each cycle.

Data Analysis
Student knowledge competency data were analyzed using descriptive statistical analysis, namely by calculating the average score of student knowledge competencies, with the following formula:

$$\overline{X} = \frac{\sum X}{N}$$

Annotation:
$\overline{X}$ = The average value of student achievement
$\sum X$ = Total learning achievement scores for all students
N = The number of students

To determine the success of students in understanding the material, it is analyzed with the minimum completeness criteria (KKM). Students are considered complete in mastering material in mathematics content if the student has obtained a value ≥ KKM.

Success Indicators
Classroom action research that discusses the improvement of students' knowledge competencies through the Discovery Learning learning model of Mathematics content class II A SD No. 5 Dalung is said to be successful if it meets the criteria for the average score of student knowledge competency at least reaching the minimum criteria (KKM) set by the school of 65, with minimum completeness of 75%.

3 Results and Discussions

Research result

In this section, we will describe the data obtained from this action research in detail based on the research conducted at SD No. 5 Dalung. The reason this research was conducted was because of the low knowledge competency scores of Class II-A students on Mathematics content, where the classical average score only reached 52.46 and the percentage of completeness reached 41% so that it could be categorized as incomplete and had not yet reached the KKM demands Mathematics content in Class II A is 65, for that reason this research was conducted in 2 cycles, as follows.

Cycle I

Action Plan I

The results obtained from planning activities include:

a. Determine students or classes that will be used as research sites concerning knowledge competencies and those who have not fulfilled the KKM (65).
b. Analyzing the characteristics of students who have been subjected to research and carefully examining the constraints and alternative actions that can be used to overcome them.
c. Checking the research implementation schedule has been planned.
d. Arrange in detail the planned action scenarios and carry out re-assessments to minimize the possibility of errors.
e. Conduct interactive discussions with peers, students, and school principals regarding the selection of the best actions to be implemented to improve students' knowledge competencies.
f. Checking previous deficiencies such as learning models.
g. Develop a plan to overcome existing problems.

Implementation of Actions I

In cycle 1, it begins with activities to manage the Mathematics content learning process. The implementation of the action refers to the RPP made. In the implementation of learning using the discovery learning model by implementing TPACK, it includes several stages, namely:

a) Stimulation (Stimulation / Giving Stimulation)
b) Problem Statement (Statement / Problem Identity)
c) Data Collection (Data Collection)
d) Data Processing (Data Processing)
e) Verification (Proof)
f) Generalization (Drawing Generalization Conclusions)

Observation / Observation Cycle I

a) Enter the class via the zoom application link.
b) Entering the class by saying greetings continues by giving an explanation of the test that must be done, sending an evaluation link to the google classroom which is used to answer test questions to students.
c) Allow students to fill in the attendance link for taking the test.
d) In making observations, researchers use the types of instruments that have been prepared previously in the RPP.
e) All tests that have been prepared refer to the indicators and competencies of the students who want to be measured.
f) Overseeing the implementation of tests so that students do the evaluation independently to obtain valid data or can be accounted for its validity.
g) At the time of carrying out the test via Google Form, the teacher supervises carefully so that students do not cooperate so that the validity of the results obtained can be accounted for.

The results of the observation of the learning cycle I can be presented in the following table 1:

Table 1
The results of the observation of the learning cycle I

Total Value	1500
Average (Mean)	57,69
KKM (Minimum Completeness Criteria)	65
Number of Students who Must be Emitted	11
Number of Students who Need Enrichment	15
Percentage of Complete Learning	58%

Qualitatively, the average value obtained by students classically in the first cycle is classified as "low" because the average value obtained by students is 57.69. The number of students who have not reached the KKM is 11 people and 15 other students who have reached the KKM. Thus learning completeness To provide a clear picture of the competence of knowledge of Mathematics content in cycle I can be seen in Figure 1.

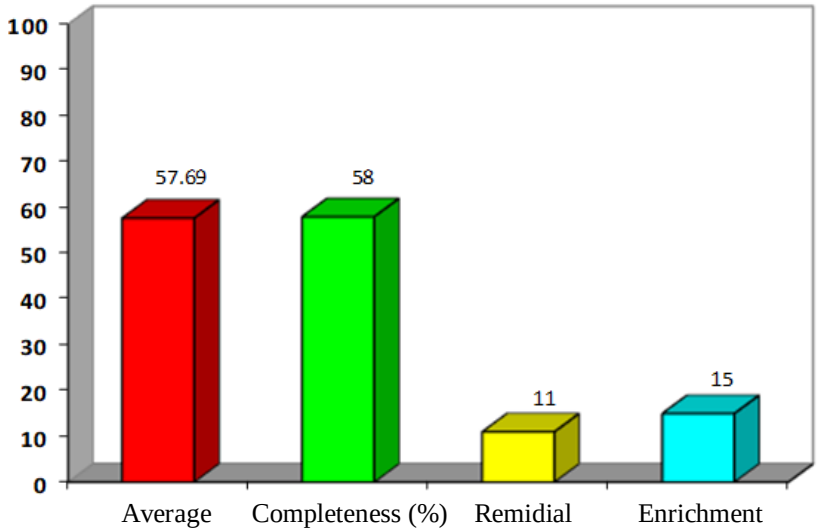

Figure 1. Knowledge competencies of mathematics in cycle I

Based on the knowledge competency data cycle I, it is known that mastery learning (KB) has not been achieved following the success criteria, namely the Minimum Completeness Criteria (KKM) 65 for each student with classical completeness ≥ 65%. Therefore the Mathematics content in class II A SD No. 5 Dalung in cycle I have not finished yet, for that action cycle II which has the same stages as cycle I.

Reflection Cycle I

Based on the results of observations on the implementation of this first action, it is still necessary to improve the learning process. Improvement is an effort made to improve the quality of learning, especially increasing the competence of students' knowledge. From the recording that was carried out the constraints that were still found in cycle I, among others;

a) Students are not used to being given problems at the beginning of learning and feel awkward to learn.
b) Guide students who are slow in completing their assignments so that they can use their time efficiently.
c) There is still a need for varied media and learning resources to attract students' attention and create an interactive atmosphere.
d) Quantitative analysis of students' knowledge competence cycle I

From the results of the reflection, it can be analyzed that the competence of knowledge of the first cycle students is that of 26 students the average value obtained is 57.69 with a percentage of 58% of learning completeness and students who are given remedies are 11 people and students who complete being 15 people (58%). This proves that the students' scores have not reached the KKM with the incomplete category. Thus, to achieve the maximum value or following the KKM, the research is continued to the next cycle.

Research Cycle II

Action Plan II

The results obtained from planning activities include:

a) Arrange in detail the planned action scenarios and carry out re-studies to minimize the possibility of errors.
b) Conduct interactive discussions with peers, students, and school principals regarding the selection of the best actions to be implemented to improve student achievement.
c) Checking previous deficiencies such as learning models.
d) Develop a plan to overcome existing problems.

Implementation of Actions II

1) Stimulation / Giving Stimulation
2) Statement / Problem Identity
3) Data Collection
4) Data Processing
5) Proof
6) Draw Conclusions Generalization

Observation / Observation Cycle II

1) Allow students to fill in the attendance link to take the test.
2) In making observations, the researcher uses the type of instrument that has been prepared in the RPP Mathematics content.
3) All tests that have been prepared refer to the indicators and competencies of the students who want to be measured.
4) Overseeing the implementation of the test so that students work independently to obtain valid data or can be accounted for its validity.
5) At the time of carrying out the test via a google form, the teacher carries out careful supervision so that the validity and validity of the results obtained can be accounted for.
6) The results of the observation of cycle II learning can be presented in the following table 2:

Table 2
Results of the observation of cycle II learning

Total Value	2105
Average (Mean)	80,96
KKM (Minimum Completeness Criteria)	**65**
Number of Students who Must be Emitted	0
Number of Students who Need Enrichment	26
Percentage of Complete Learning	100%

Qualitatively, the average value obtained by students classically in the second cycle was quite high because the average value obtained by students was 80.96. All 26 students have reached the KKM. Thus the completeness of learning (KB) of students in cycle II is 100%. The increase in the Competence of Mathematical Content Knowledge can be presented in Figure 2.

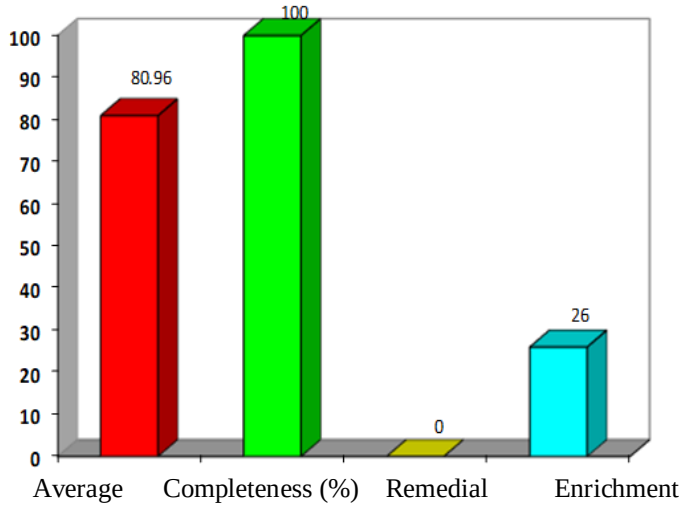

Figure 2. Knowledge Competencies of Mathematics in Cycle II

Based on the learning outcome data above, it is known that learning completeness has been achieved following the predetermined success criteria, namely the KKM for each student is 65 with classical completeness ≥ 75%. Therefore, this study is considered successful and can be stopped.

Reflection Cycle II
Based on the results of observations on the implementation of this second action, learning has shown an increase, both from students who have not completed to be complete, and those who have completed have also increased even more. This result is because students have been able to carry out the Discovery Learning learning model maximally and understand the lesson plan even though it is not optimal.

Quantitative analysis of student achievement in cycle II
From the results of the reflection, it can be analyzed that the knowledge competence of students in cycle II has shown a very significant increase, namely, from the 26 students the average value obtained is 80.96 with the percentage of learning completeness of 100%. This proves that the student's score has reached the KKM in the complete category. Thus, this classroom action research was stopped until cycle II.

Discussion
Discussion of the results obtained from cycle I

Things that need to be considered in the discussion of peer teacher observations about the content of Mathematics are: existing weaknesses, strengths, changes, advances, time effectiveness, activeness carried out, construction, contribution, description of facts, checking internal validity and external validity, problem identification, influencing factors, ways to solve problems, considerations, comparisons, comments, responses, additional experiences, summary, opinions, descriptions description, interpretation/interpretations, the meaning behind the action, triangulation, the relationship between aspects, classification, standards of scoring, reasons for the use of certain techniques, reasons for using certain measures, classifications, aggregations, tabulations, usage, criteria, categorization, definitions, relationships between categories i.

From peer observations, it is conveyed that there are advantages conveyed by the observer, namely that the researcher has used polite language, guiding students well. This raises the interpretation that the research journey is quite good. Weaknesses that are conveyed need to be given an analysis, namely the use of the time that has not been effective, construction, student contributions have not been maximized, this fact will be used as a reference for the correctness of the data, validation, internal validity taken from informants is accounted for, external validity in the form of legal references used supporting theories and the reliability of this research data can the author believe because it is the accuracy of the researcher in choosing informants, namely peers. The factors that have not been maximized in the first cycle are because the researcher has only tried this model once. The way to solve the problem is to prepare a better, higher quality lesson plan. Other things such as comments, additional experiences, descriptions of research success will be seen in the results of the next cycle. So few qualitative results or quality of learning with the Discovery Learning learning model.

The result of the knowledge competency test, which is a multiple-choice test, allows students to understand what they have learned. The average score of students in the first cycle was 57.69 indicating that the students had mastered the material being taught even though it was not perfect. These results indicate an increase in students' ability to master Mathematics content. When compared with the student's initial score according to the data that has been presented in the previous analysis. The remaining obstacle that needs to be discussed is that the knowledge competence achieved in cycle I have not met expectations following the demands of the KKM for the Mathematics content in this school, namely 65. Therefore further improvement efforts still need to be made so that more careful planning is needed for the next cycle.

Discussion of the results obtained from cycle II

The results obtained from the knowledge competency test in cycle II showed that the students' ability to take lessons was good enough. This is evident from the student's average score of 80.96. These results indicate that the Discovery Learning learning model has succeeded in improving students' ability to forge knowledge as expected. The comparison of the values that can be conveyed is the initial value, the value of cycle I, and the value of cycle II, there is a significant increase, namely from the average value in cycle I am 57.69 the percentage of completeness is

58% and in cycle II it increases to 80.96 with the percentage completeness reaches 100% in other words in cycle II all class II A students totaling 26 people have reached the KKM score even more than the KKM. This increase cannot be underestimated because this increase in value is a result of the maximum efforts undertaken by researchers to improve the quality of education and progress of education, especially in SD No. 5 Dalung, North Kuta District, Badung Regency.

4 Conclusion

Based on the results of the research and discussion described in the previous chapter, it can be concluded that the following matters. The use of the Discovery Learning Model can improve the competence of Mathematics content knowledge of class II A students of SD No. 5 Dalung 2020/2021 Academic Year. It can be seen that the average competence of students' knowledge of 57.69 and completeness of learning 58% increased the average to 80.96 completeness of learning 100%. Broadly speaking, the flow of the use of the Discovery Learning model is used to solve the problem of the low level of competence in Mathematics content knowledge of class II A students of SD No. 5 Dalung.

Suggestion

Based on the research results obtained from this PTK, there are several suggestions to offer, including:

a) Teachers are expected to be able to use the Discovery Learning learning model as an alternative in implementing Mathematics content learning because this model can make the learning process more effective.
b) Students are expected when learning with the Discovery Learning learning model to always focus and maximize all the knowledge and abilities students have so that learning runs optimally.

Conflict of interest statement

The author declared that she has no competing interests.

Statement of authorship

The author has a responsibility for the conception and design of the study. The author has approved the final article.

Acknowledgments

I am grateful to two anonymous reviewers for their valuable comments on the earlier version of this paper.

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